

Mission STEM

Rules for Energy Transfer Machine (ETM) on Video

The ***Energy Transfer (ET) Machine on Video*** competition provides a hands-on opportunity for elementary, middle and high school students to use their STEM skills in a fun and creative way. Students are challenged to transform everyday materials into unusual, Rube Goldberg - type machines that accomplish a task at the one minute mark using a variety of energy transfers including power from a battery. Entries include a videotape of the ET Machine performing its various energy transfers and its final specified task from start to finish. Videos are submitted for judging as described below.

Competition Guidelines

1. The Energy Transfer Machine competition is comprised of three divisions, elementary (3rd – 5th grades), middle (6th – 8th grades) and high (9th - 12th grades) school.
2. Entrants may be submitted by one student or a team composed of one (1) to six (6) students.
3. Schools are limited to three entries.
4. This competition is limited to a total of 35 entries on a first-come basis.
5. ET Machines are not to be transported to the competition, therefore size, shape and dimensions are not limited. However, it must be designed so that it is possible to videotape the performance of the ET Machine from start to finish from a single video camera without using cuts or edits in the taping.

Timing Machine Specifications

The machine shall:

1. perform a team-specified operation at the one (1) minute mark as the final step of the machine.
2. have a minimum of five (5) steps in completing its team-specified task with at least one (1) step using electricity from a battery that does not exceed 9 volts.
3. be any size, shape or dimension
4. demonstrate a series of energy transfers. Identical transfers of energy in succession (such as a row of dominoes falling into each other) should be considered one step.
5. not use any actual timing devices manufactured for that purpose.
6. be constructed solely of parts provided by those designing and building the ET Machine. Individualized components may be purchased, but the entire timing apparatus must be designed, assembled and when possible, fabricated by students. All component and fabrication choices must also be made by student team members.
7. not use animals, hazardous materials, explosives or flames.
8. not imply nor convey profane, indecent or lewd expressions.
9. be safe and not pose harm to anyone or anything.

The machine may use programmable logic controllers or any other electronic controller; however, the programmable logic controller must not use any internal timer.

Video Specifications:

1. In the introductory segment, the narrator(s) will be on-screen and will state the school name, division, project name, as well as describe the various steps and energy transfers of their machine and what it will do as its final task at the 1 minute mark. (Non-team members on-screen will result in disqualification).

Mission STEM

Rules for Energy Transfer Machine (ETM) on Video

2. As the steps and energy transfers are described, those areas of the machine should be pointed to by the narrator (or other team member) and shown in the camera view. This sequence may not exceed 3 minutes in duration.
3. At the beginning of the machine sequence of the video, the announcer will say, “Ready, Set, Go” for the official timing process to begin.
4. No edits are allowed to the machine portion of the video from the point where the narrator says, “Ready, Set, Go” to the completion of the ET Machine’s final task. A complete run must be documented in this fashion. **Any edits to this portion of the video will be grounds for disqualification.**
5. If a team member interacts with, interferes or assists their machine once time has started, the machine timing will stop at that point and that time will be reflected in their precision score. However, **if a nudge or an assist is needed to complete the run, the entry will still be judged on the remaining criteria.**
6. The clock will be stopped and time recorded when the team designated, one-minute, final task occurs.
7. It is expected that the video of your most successful run (from start to finish – no edits) will be submitted for judging. **Take advantage of the opportunity to videotape your machine multiple times to get the best run documented.**
8. If the designated action does not occur by the end of two minutes, a DNF (did not finish) will be documented for the timing portion of the judging.
9. The video should be uploaded to **YouTube.com by 5:00 p.m., February 11, 2026** and the **YouTube link emailed to Sunsmart@fsec.ucf.edu** to be eligible for judging. An email confirming receipt of your video link will be sent within two business days.

Tips for Better Quality ETM Videos

1. Turn your phone on its side. Wide videos look better on screen.
2. Speak up! Project your voice as if you were on stage.
3. Turn on all available lights. If you are outside, make sure the sun is behind the camera operator.
4. Record the video at the largest size and highest quality settings. When exporting it from your video editing program, don’t compress it too much; upload a large video file to maintain the quality.

Energy Transfer Machine Awards

1st place awards will be given in each division for Best Design. These awards will be decided by points awarded for:

- number of energy transfer steps
- complexity and technical sophistication of machine
- use of the electricity from the battery
- precision - how close the team defined end task came to the one minute mark
- creativity, originality, unconventional material use and design aesthetics
- team knowledge
- clear and effective communication skills
- clarity of the video to effectively showcase the ET machine’s operation

